



The AutoICE Competition: Automatically Mapping Sea Ice in the Arctic

Andreas Stokholm¹, Jørgen Buus-Hinkler², Tore Wulf², Anton Korosov³, Roberto Saldo¹, David Arthurs⁴, Rune Solberg⁵, Nicolas Longépe⁶, and Matilde Kreiner²

¹Technical University of Denmark, National Space Institute - DTU Space, Denmark (stokholm@space.dtu.dk)

²Danish Meteorological Institute, Denmark (mbje@dmi.dk)

³Nansen Environmental and Remote Sensing Center, Norway (Anton.Korosov@nersc.no)

⁴PolarView, Denmark (david.arthurs@polarview.org)

⁵Norwegian Computing Center, Norway (rune@nr.no)

⁶European Space Agency, Centre for Earth Observation, Italy (nicolas.longepe@esa.int)

The AutoICE Competition, launched on ESA's AI4EO platform, brings together AI and Earth Observation practitioners to address the challenge of “automated sea ice mapping” from Sentinel-1 SAR data. Traversing the polar waters safely and efficiently requires up-to-date maps of the constantly moving and changing sea ice conditions showing the current sea ice extent, local concentration, and auxiliary descriptions of the ice conditions. For several decades, sea ice charts have been manually produced by visually inspecting and analysing satellite imagery.

The objective of the AutoICE challenge is to advance the state-of-the-art for automatic sea ice parameter retrieval from SAR data to derive more robust and accurate sea ice maps. The challenge design and evaluation criteria have been created with input from machine learning experts and members of the International Ice Charting Working Group (IICWG). In this competition, participants are tasked to build machine learning models using the available state-of-the-art challenge dataset and to submit their model results for each of the three sea ice parameters: sea ice concentration, stage of development and floe size. The dataset made available in this challenge contains Sentinel-1 active microwave (SAR) data and corresponding Microwave Radiometer (MWR) data from the AMSR2 satellite sensor to enable challenge participants to exploit the advantages of both instruments and to create data fusion models. Label data in the challenge datasets are ice charts produced by both the Greenland ice service at the Danish Meteorological Institute (DMI) and the Canadian Ice Service (CIS). The challenge datasets also contain other auxiliary data such as the distance to land and numerical weather prediction model data. Two versions of the challenge dataset are available, a raw dataset and a ready-to-train dataset. The datasets each consist of the same 513 training and 20 test (without label data) scenes, however, the ready-to-train version has been further prepared for model training. In addition, a number of tools are made available to help the participants get started quickly, including access to machine learning computing resources on the ESA Polar Thematic Exploitation Platform (Polar TEP). The competition was initiated on the 23rd of November 2022 and is expected to conclude on the 17th of April 2023.

Here, we present the overall challenge, the underlying objective, the available state-of-the-art dataset and resources, the progress of the challenge and its results, as well as a sneak peek of our upcoming ASID-v3 dataset.